UCRL-JC-125678 ABS

American Association for Cancer Research, April 12-16, 1997 San Diego, CA

Assessing somatic radiation damage from the Chernobyl accident.

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To define the exposure and evaluate the dosimetric assays alone and in combination, three somatic mutation assays are being applied to a human population exposed to low-dose, whole-body, ionizing radiation. The assays are: stable chromosome aberrations in lymphocytes detected by fluorescence in situ hybridization; glycophorin A mutation in erythrocytes; and hypoxanthine phosphoribosyltransferase (HPRT) mutation in lymphocytes. Approximately 350 people, including 1) Russians exposed to doses of ~5-25 cGy while working on cleanup of the Chernobyl nuclear power plant accident of 1986 and 2) Russian controls, have been studied. The current cytogenetic estimate of exposure of population is 13 $\pm$ 4 cGy. The ability to detect radiation exposure by the lymphocyte assays is enhanced by adjusting for age and smoking. The glycophorin assay is less affected by these variables; its sensitivity may be limited by unidentified sources of variation. The order of decreasing sensitivity for detecting radiation induced damage in this population is: chromosome aberrations, HPRT mutants, glycophorin A mutants. Continuation of these studies will determine the optimal deployment of these assays in populations with potential for low-dose radiation exposure. Work by LLNL under auspices of US DOE contract W-7405-ENG-48 with support from PO1 CA59431.